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Christiani Hugenii Astroscopia compendiaria, Tubi optici molimine liberata. Or the description of an Aerial Telescope.

The use of Telescopes being so necessary for *Astronomy* it hath been the endeavour of several lovers of that science to find out some more convenient and easier way, for the handling of the same. Then whereas all the perfection that hitherto hath been added to Telescopes, chiefly consisteth, in making them very long and the glasies of a bigger sphere, the same length and bigness thus increased, hath been stifted by a troublesome heaviness and disproportion to manage and direct them to the Stars. The Author hence, to take off the incumbrance, hath found out a devise in cutting or leaving out almost the whole tube, saving only a small part of it near the objective glass, and somewhat towards the Eye glass, ordering these two extremities in such a manner, that they may do the same service, as if the whole tube of one piece should be employed. To this purpose he explaineth himself by a scheme and clear description, how a mast must first be perpendicularly fixed into the ground, which for his own use he tells, was made of 50 foot long, serving for a Telescope of 70 foot, then joyning two parallel rules all along this mast, he declareth how by this means the objective glass may be easily drawn up and downwards by the help of a string or cord, applied to an equilibrated weight, so that it be correspondent to the Eye glass. The circumstances whereof can be read in his printed paper, where also the full structure is to be seen. Only to come to the objection which the Author proposes himself, against the use of this curtailed Telescope. The *First*, is the fickleness in keeping always the Eyeglass in the same posture: to remedy this, he describeth a two legged instrument to be put under the 2 arms, to hold them up the more steadily. *Secondly*, it seemeth to be a hard matter, to find out at night time in such a distance the objective glass or the Stars you look for, the cord alone not being able to direct the whole business: to help this inconveniency, he saith, one must make use of a lantern, which being in the same manner as commonly used for the projection of images, and dispersion of light, will give direction for the finding the objective glass, by enlightning the same for to

to make a due agreement with that other glas. But as to observe the Moon, there needs nothing of this, when the glas easily may be discovered by the Moon light it self. *Thiray*, it is very difficult to find (in such a length of a Tube of 100 or 200 foot) the true parallelism of the two glasses, the string being bended in the middle, and also not fit to give a true or strait direction. To this he answereth 1. that there is no need of such a geometrical perfection of parallelism, but that the same may have some latitude. 2. The string being of a small weight, and only a silk thred, which 50 foot long doth scarce amount to halfe a drachm, and yet able to hold 7 of weight, this bending of the string will cause only a small error, for to find how much the bending maketh it decline, if it is supposed to be a parabolical line in the curvature, the angle of deflection by the tangent will come to 24 minuts which in 150 foot distance produceth an error of one foot, that the Eye will be out of her true way of direction. But to remedy all this, he sheweth how by the help of the Lanterne such mistakes may be corrected. *Fourthly*, the constitution of the air, as being windie, or tempestuous will make a great hindrance, for the string or cord will be altered and drawn at one or the other side. To prevent this, there is no remedy: the common sort of Telescopes being subject to the same troubles. Yea sometimes, when the air is very quiet and the Sky clear, yet the stars much glittering, the Telescopes will not serve, also the vapours sometimes will stick to the glas. *Fifthly*, against the lantern before mentioned, one might object that at a distance of 200 and more foot, the light projected would be very weak, and not well to be discerned: but to make it brighter, a greater lantern must be got and a bigger wick put in and other things ordered accordingly. *Sixtly*, if it should be too troublesome to, to fix such a long mast of a 100 and more foot, the Author sheweth how the composition of masts joyning one to another may be continued as far as necessity shall require. Yet for all that, he thinks, there will be no need to make these masts of such a vait height: for no body will bring the Telescopes to such a perfection as to make appear any animal or creature in the Moon or Planets.

Because, first, there is such a difficulty in making the glasses, for the bigger they are, the more art is required in performing them. 2. There is scarce any piece of glas to be found fit for such a large busines, being pestered with many faults. 3. The amplification of the things seen by Telescopes being regulated by the bigness of the aperture that

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The objective glass will be in somuch that the apertures are in a subduple reason to the lengths, it followeth that a Telescope of 30 foot requiring an aperture of 3 inches, to an other of 300 foot, that will bear no more then 9 inches and a half, is as 1 to 3, that is, will magnify but 3 times as much, but if it should make 10 times as big, it would require a length of 3000 foot, which he thinketh not to be practicable.

4th. There are still some irregularities in the nature of refractions, as is proved by Mr. *Newton's* experiments of colour, yet as far as is known, the said reason of the apertures to the lengths is thereby confirmed. Finally, for the better use of this Telescope, he giveth an admonition, that to observe the Satellits of Saturn found out by *Cassinius*, it is convenient to look through a narrow aperture, to exclude the light that cometh from the sides, and to restrain the apple of the Eye, which in the dark use to be very large and open.

O X F O R D,

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